

TRANSMISSION

LINES . . .

YOUR PIPELINE

TO THE OUTSIDE WORLD

*How to choose
the right feedline
for your station
and how to get
the most out of it*

BY JIM FISK, W1HR

Receiver, transmitter, transmission line, antenna — each is equally important to the operation (and success) of your amateur station. No matter how good your antenna is, or how powerful your transmitter, if your receiver is insensitive or unable to separate strong, nearby signals, you won't be able to hear all the stations that can hear you. Likewise, if your receiver is super, but your transmitter isn't doing the job it should, you will be able to hear weak, faraway stations that your transmitter just can't reach. So it is with each of the

building blocks in your station — like a chain which is only as strong as its weakest link, you can't neglect one of the links without affecting overall station performance. Your transmission line is one of these links.

After spending a good chunk of your hard-earned money on a transmitter and receiver, and putting up the best antenna you can afford (or your landlord will allow), the transmission line is often an afterthought. Little attention is paid to its selection or installation, and yet, for only a few dollars, its

performance can often be improved a hundredfold! In this article we'll give you some tips on how to select the best transmission line for your station and how to hook it up.

Balanced feedlines

Years ago all amateurs used balanced open-wire feedlines made from no. 12 or 14 (1.5-2.0mm) copper wire, separated every two or three feet (1m) by spacers as shown in Fig. 1A. In the very early days most amateurs made their own feedline spacers by boiling wooden dowels in beeswax; later on, after ceramics were perfected, several firms made low-cost ceramic spacers which were very popular. Following the war, plastics with good rf insulating properties became available and they quickly replaced the more expensive ceramic spacers. Plastic spacers also lent themselves to the manufacture of commercial "ladder line" — whereas wood and ceramic spacers had to be tied in place, plastic spacers had a low melting point so they could be attached by simply heating the wire and pressing it into the plastic.

Twinlead or ribbon line, Fig. 1B, was the next step in the development of balanced feedlines. Originally designed for use with television receivers, it consists of two parallel wires imbedded in a web of polyethylene plastic. Although television twinlead was an inexpensive answer to the feedline problem, the conductors were pretty small for transmitting purposes, and losses increased dramatically whenever it rained. The manufacturers solved the conductor problem by



introducing heavy-duty twinlead with heavier conductors which was marketed specifically for transmitting purposes. The effects of rain were minimized to a certain extent by the use of the tubular construction shown in Fig. 1C which provides a longer path between the two conductors.

There was a time, 45 or 50 years ago, when practically every transmitting station in the world used open-wire feeders — there was simply nothing else available.

Although balanced feeders had very low loss, a big plus, they also had their problems: They had to be kept well away from metal objects; they had to be installed high above ground; bends and turns in the line had to be very gradual, and they often twisted in the wind, shorting out the two conductors. Since balanced, two-wire feedlines were used

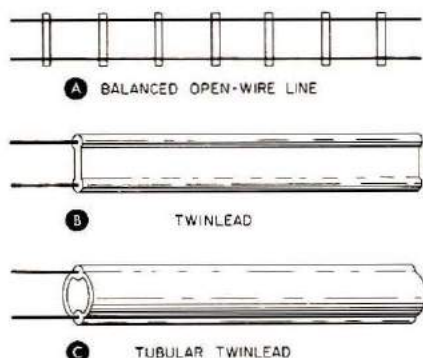


Fig. 1. Three types of balanced feedlines which are sometimes used by radio amateurs. Many years ago the open-wire feeder in A was used by practically every radio station in the world; today it is seldom seen. Twinlead B was originally developed for home television receivers, although heavy-duty versions are available for transmitting use. The tubular twinlead in C has somewhat lower loss than conventional twinlead, but is available only in low power versions.

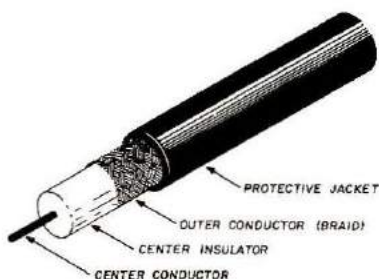


Fig. 2. Construction of modern, flexible coaxial cable. Center insulator may be polyethylene, Teflon, polyfoam, or other low-loss plastic. Some types may have a double braid covering for extra shielding, or silvered conductors for low loss.

by everyone, the transmitters of the time were designed to match them. That isn't true anymore, but some of the popular amateur antenna handbooks still persist in pushing the use of twinlead and open-wire feeders. This is not to say that balanced feedlines are all bad — in some applications they are a very good choice — but modern amateur equipment is designed for use with coaxial cable and is not directly compatible with balanced feedlines. In fact, if you were to make a survey of active amateurs, you'd probably find that 99 out of 100 are using a coaxial transmission line.

Coaxial cable

The coaxial transmission line is inherently unbalanced and consists of a center conductor which is surrounded by a grounded shield or outer conductor as shown in Fig. 2. Since the rf field is contained completely within the shield, this type of transmission line is not sensitive to nearby objects — unlike balanced feeders, it can be run through metal

conduits, taped to tower legs, buried in the ground, or even run underwater. Although balanced feedlines predate coaxial cable so far as amateur use is concerned, the basic coaxial structure received considerable attention from telephone engineers in the late 1800s who were trying to improve telephone transmission, particularly in transatlantic submarine cables.

In the early 1930s Bell Telephone engineers started experimenting with coaxial lines for the transmission of high-frequency radio waves, and found that they worked very well. The rigid, air-spaced, solid copper lines used in these studies weren't practical for amateur stations, but commercial broadcasters quickly adopted them as standard equipment. Most of these early coaxial lines were built with ceramic disks or beads spaced at intervals along the line to support the inner conductor, a technique that is still used today (Fig. 3).

Flexible coaxial cable first appeared on the scene in the late 1930s, but it was

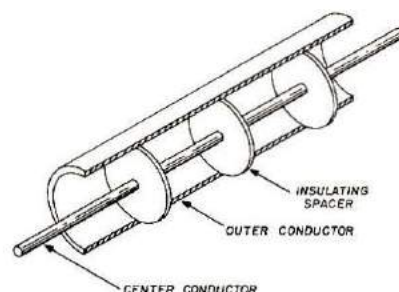


Fig. 3. Construction of coaxial air-insulated line which is used by high-power, commercial stations. This arrangement was first devised more than 40 years ago, and except for the use of modern plastic spacers (usually Teflon), it has changed very little.

expensive, and amateur transmitters of the day were designed for *balanced* feedlines, so few amateurs were interested in giving it a try. Although this cable used woven copper braid for the outer conductor (and a natural rubber weather shield), the resemblance to modern flexible coax stopped there. Polyethylene was discovered in 1937, but wasn't available in commercial quantities until much later, so this first flexible coax used ceramic spacers like its more expensive cousins. Some manufacturers tried using natural rubber as a flexible dielectric, but the losses were far too great for use at radio frequencies.

Most of the military equipment built during the war was designed for use with coaxial transmission lines, and the armed services bought thousands and thousands of feet of flexible coaxial cable which used polyethylene as the center insulator. After the war ended, much of this cable showed up on the surplus market, but many amateurs were still using transmitters from the 1930s and didn't think the conversion from balanced feedlines was worth the

trouble. However, commercial television was on its way, and the impact of television interference quickly put an end to unshielded radio transmitters — and their balanced feedlines. Although balanced feeders don't radiate under ideal conditions, few amateur stations were ideal, with the result that the feedline often radiated unwanted rf into nearby television sets. Coaxial transmission line didn't solve all the TVI problems but it did keep the rf bottled up until it reached the antenna where it belonged.

Feedline characteristics

If you've read the operating manual for your transmitter (or transceiver), you know that the rig likes to "look into" a 50-ohm load, with a standing-wave ratio (swr) not greater than 2:1. You have probably asked yourself, "Why a 50-ohm load? Why not 25, 75, or 100 ohms, or some other value?" This is a good question — with an answer that has an interesting story behind it. But before we get to the story, let's talk a little about one feedline parameter that's always listed in the catalogs: Characteristic impedance.

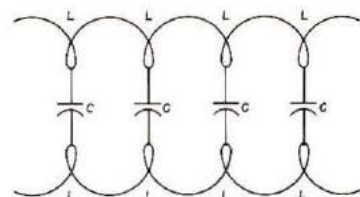
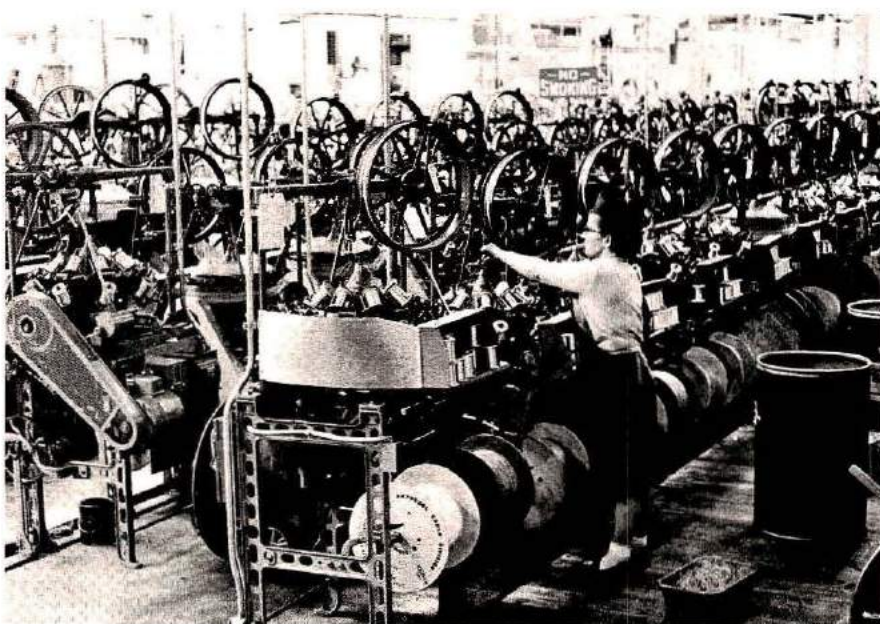


Fig. 4. Every transmission line is made up of distributed capacitance and inductance, as shown here. When rf energy is applied to the line, these components set up a fixed relationship between voltage and current, thereby establishing the characteristic impedance of the line.

Any transmission line, balanced or unbalanced, twinlead or coaxial line, has a certain amount of capacitance and inductance per unit length as shown in **Fig. 4**. These components are distributed equally along the length of the line (called *distributed* components) and don't behave exactly like individual capacitors and inductors (which are called *lumped* components). When rf energy is applied to the transmission line, the distributed components establish a fixed relationship between voltage and current which, from Ohm's law, results in the characteristic impedance of the line.

Since the distributed capacitance and inductance along the line are a direct result of conductor diameter and spacing, and the insulating material used between them, it follows that the characteristic impedance of the line can also be calculated from the same dimensions. For coaxial transmission line the characteristic impedance is determined by the ratio of the size of the outer conductor, D , to that of the inner conductor, d , as shown in **Fig. 5**. Assuming the outer diameter is held constant, say at 1 inch (25mm), the smaller the center conductor, the higher the characteristic impedance.

Unfortunately, there is no one ratio of conductor diameters which is optimum for all important transmission parameters. For example, a



Braider machines in Amphenol's Chicago plant; machines cover thousands of feet of coaxial cable daily with copper braiding (photo courtesy Amphenol).

coaxial line which has minimum loss (called attenuation) is not optimized for maximum power, and a line which is designed for maximum breakdown voltage does not have minimum loss. This is shown graphically in Fig. 6. As can be seen, power handling peaks at a characteristic impedance of 30 ohms, breakdown voltage peaks at 60 ohms, and minimum attenuation occurs at about 77 ohms.

Where, then, did the 50-ohm standard originate? Well, when the U.S. Navy was establishing standards for coaxial cable during the war, an industry committee recommended that 50 ohms be selected as a compromise between the three important transmission parameters and commercially available copper water-tubing sizes. It's interesting to speculate where we would be today if the plumbers hadn't come to the rescue!

Actually, the 50-ohm coaxial transmission line is a pretty good compromise because loss is only about 10 per cent greater than the minimum at 77 ohms, and the power handling capability is only about 14 per cent less than optimum. This is of little consequence on the

high-frequency amateur bands because most of the commonly used 50-ohm coaxial cables can easily handle the maximum amateur power limit of 1000 watts.

The attenuation minimum which occurs at 77 ohms (Fig. 6) explains why the CATV companies use 75-ohm coax in their cable distribution systems — they're looking for minimum signal loss over a cable which may be thousands of feet long. In amateur stations the transmission line is seldom more than 150 or 200 feet (40-60m) long, so the difference in loss between 50- and 75-ohm coaxial lines is so small it can't be measured (assuming, of course, that both lines have the same type of center insulation). If you compare Teflon insulated line (such as that used by the CATV companies) with polyethylene lines, you'll find a measureable difference — Teflon is an easy winner.

Cable loss factors

If a transmission line were perfect it would have absolutely no losses, and no power would be lost as the rf traveled from your transmitter to your antenna. Unfortunately, it's impossible to make a perfect line so all transmission

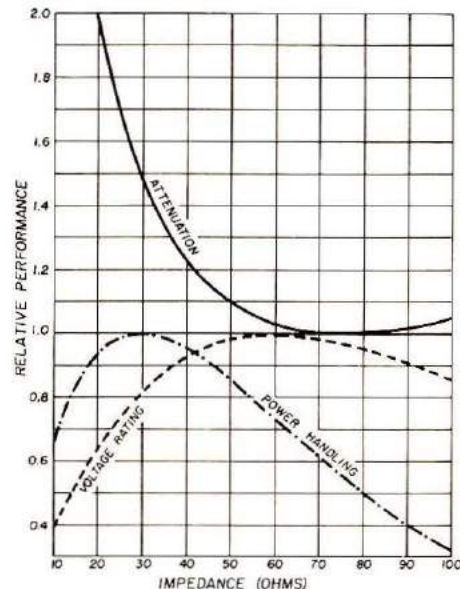


Fig. 6. The important transmission line parameters as a function of the characteristic impedance of a coaxial line. Power handling peaks at 30 ohms, voltage breakdown is highest at 60 ohms, and minimum loss occurs at 77 ohms. The 50-ohm lines often used by amateurs represent a good compromise between these values.

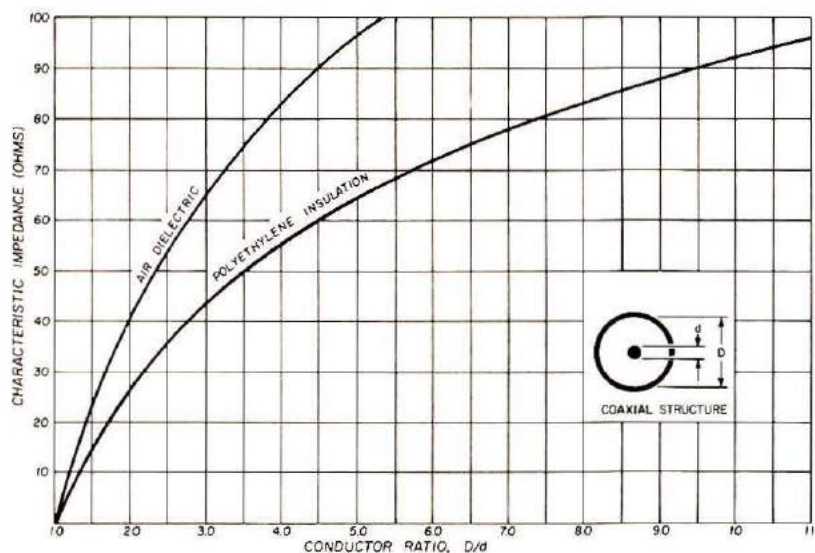


Fig. 5. The characteristic impedance of a coaxial line is determined by the ratio of the conductor sizes, and the material which is used for the center insulator.

lines have a certain amount of loss. This is usually measured in terms of decibels (abbreviated dB) per hundred feet of line. Decibels are a measure of power input to power output, or power ratio, as shown in Fig. 7, and greatly simplify the mathematics when you have to figure out total loss (or gain). For example, when a transmit/receive relay which has 0.5 dB loss is connected to a lowpass filter which has 0.3 dB loss, which is connected to a transmission line with 3 dB loss, the total loss from the transmitter to antenna is 0.5 + 0.3 + 3.0 or 3.8 dB (see Fig. 8). If these same losses were expressed in simple arithmetic terms, 0.5 dB loss through the relay means that only 89 per cent of the power at the input connector makes it through to the output. Similarly, 0.3 dB loss in the filter corresponds to 93 per cent power transmission, and 3.0 dB cable loss is the same as 50 per cent transmission.

Let's say your transmitter

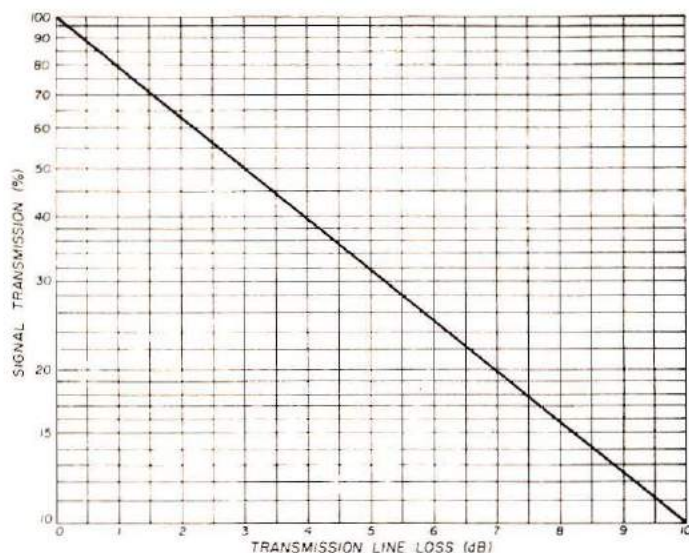


Fig. 7. Decibel or dB values expressed in terms of power ratio. Since cable loss in dB is directly proportional to cable length, the use of dB simplifies loss calculations, as discussed in the text.

has 100 watts output. Because of loss through the relay, only 89 per cent of the power at the input is available at the output, or 89 watts. The loss through the filter reduces this still further, so 93 per cent of 89 watts (about 83 watts) is available at the input connector to the transmission line. Since only 50 per cent of the power makes it through the transmission line, the power into the antenna is about 41.5 watts or 41.5 per cent of the total power delivered by the transmitter. This is exactly the same as 3.8 dB loss, as can be seen from Fig. 7, but the dB values are obviously a lot easier to use because they can be simply added together.

If you're not familiar with using dB, here are some guidelines which may be helpful: First of all, 1 dB is about the minimum change which you can detect with your ear; -3 dB represents 50 per cent loss; -6 dB corresponds to 75 per cent loss; and -10 dB is the same as 90 per cent loss. With these values in mind, it's not too difficult to interpolate for values in between.

Given in Table 1 are the loss figures for coaxial transmission

lines commonly used by amateurs. RG-8/U, for example, has 0.66 dB loss per 100 feet (30m) at 14 MHz. With 100 watts into the transmitter end of the transmission line, this means that 86 watts will make it to the antenna to be radiated. However, this figure assumes that the antenna is matched to the feedline — that the input impedance to the antenna is the same as the characteristic impedance of the coaxial cable. If the line is not matched to the antenna, the loss will be *slightly* higher, as will be discussed later.

Note from Table 1 that the higher the frequency, the higher the loss per 100 feet. This is a characteristic of all types of feedlines and explains why cable selection at vhf and uhf is even more important than it is for the high-frequency bands. Note also that the smaller diameter cables have much higher losses. RG-58/U, for example, has 3.5 dB loss per 100 feet (30m) at 50 MHz — with 100 watts into the transmission line, only 45 watts get to the antenna — the other 55 watts are used to heat up the cable!

Although dB loss figures are almost always given for 100

feet (30m) of transmission line, it's very easy to translate this figure to the actual length of line which you are using. This is another benefit of using dB values — they are directly proportional to line length. If 100 feet (30m) of cable has 4 dB loss, for example, half that length or 50 (15m) feet will exhibit half the loss or 2 dB; 40 feet (12m) will have 40 per cent of the loss or 1.6 dB; 30 feet (9m) will have 30 per cent of the loss or 1.2 dB, and so on. Conversely, 150 feet (45m) of line will have 1.5 times the loss of 100 feet (30m) or 6 dB, 200 feet (60m) will have twice the loss, etc.

Choosing coaxial cable

Table 1 lists the important operating parameters for the various types of coaxial cable which are commonly used by amateurs. At last count there were something like 300 different types of coaxial cable on the market, but many of these are specialized types which are not designed for use as rf transmission lines; RG-62/U, for example, a 93-ohm line which is used for pulse work, or RG-125/U, a 150-ohm line with extremely low capacitance per unit length. There are coaxial cables with lead sheaths for underwater installations, cables with braided steel armor, and even some with very high attenuation for use in test equipment. However, most of the types used by amateurs are listed in Table 1.

Perhaps the most popular type of coax is RG-8/U, a medium-size cable with a maximum power rating of 2000 watts at 28 MHz, and somewhat more

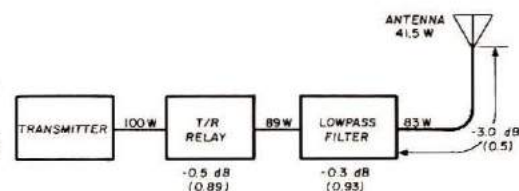


Fig. 8. Example of a loss calculation using dB. The total loss of 3.8 dB corresponds to power transmission of 41.5%.

Table 1. Important operating characteristics of 50- and 75-ohm coaxial cables used by amateurs. Types with non-contaminating jackets (designated NV) should be selected for long life. Power rating is given for 30 MHz and is somewhat higher on the lower frequencies; this is power into the transmission line, *not* transmitter input power.

Cable Type	Jacket*	Z ₀ (Ohms)	Loss in dB/100 Feet (30m)					Power Rating at 30 MHz (watts)
			3.5 MHz	7.0 MHz	14.0 MHz	21 MHz	28 MHz	
RG-8/U	V	52.0	0.29	0.43	0.67	0.81	0.98	1900
RG-8A/U	NV	52.0	0.29	0.43	0.67	0.81	0.98	1900
RG-11/U	V	75.0	0.34	0.55	0.81	1.0	1.2	1375
RG-11A/U	NV	75.0	0.34	0.55	0.81	1.0	1.2	1375
RG-17/U	V	52.0	0.13	0.22	0.35	0.42	0.52	6400
RG-17A/U	NV	52.0	0.13	0.22	0.35	0.42	0.52	6400
RG-58/U	V	53.5	0.54	0.82	1.25	1.6	1.9	575
RG-58A/U	V	52.0	0.69	1.05	1.6	2.1	2.5	500
RG-58B/U	NV	53.5	0.54	0.82	1.25	1.6	1.9	575
RG-58C/U	NV	50.0	0.69	1.05	1.0	2.1	2.5	500
RG-59/U	V	73.0	0.55	0.80	1.15	1.4	1.7	700
RG-59A/U	NV	75.0	0.55	0.80	1.15	1.4	1.7	700
RG-59B/U	NV	75.0	0.55	0.80	1.15	1.4	1.7	700
RG-8 Polyfoam	V	50.0	0.28	0.41	0.60	0.75	0.90	2000
RG-11 Polyfoam	V	75.0	0.32	0.51	0.73	0.93	1.10	1425
RG-58 Polyfoam	V	50.0	0.80	1.18	1.70	2.1	2.5	500
RG-59 Polyfoam	V	75.0	0.40	0.59	0.88	1.1	1.3	750

*V indicates a vinyl jacket; NV indicates a non-contaminating vinyl jacket.

than that on the lower high-frequency bands. Attenuation ranges from about 0.3 dB per 100 feet (30m) on 3.5 MHz, up to nearly 1 dB per 100 feet (30m) on 10 meters. RG-8A/U (also marketed as RG-213/U) has identical electrical characteristics but has a so-called "non-contaminating" outer jacket which means that it has considerably longer life. The black plastic covering on RG-8/U contains chemicals (called plasticizers) which, when exposed to sun and weather, leach into the center insulator and increase cable loss. In practical terms this means that it should be replaced about every five years. The newer RG-8A/U (or RG-213/U), however, doesn't have this problem and has a useful life of 20 years or more. Since the cost difference is only a few cents per foot, RG-8A/U or RG-213/U is a better choice.

(or its later "non-contaminating" version, RG-58B/U and RG-58C/U), but note that it has significantly greater

loss and lower power limits than RG-8/U. It also costs less, which may be a consideration, but since the difference is something less than \$10 per 100-foot roll, in the long run I think RG-8/U is well worth the slight extra cost. However, for connections between various equipment in your station where short lengths of cable are used, RG-58/U is an excellent choice.

At the other end of the size spectrum is RG-17/U, a heavy, large diameter cable which has less than half the loss of RG-8/U. It is also much more expensive so it's seldom used by amateurs unless the transmission line is several hundred feet long. "Non-contaminating" versions of RG-17/U are RG-17A/U (also designated as RG-218/U), and RG-17B/U, which has a silver-plated double braid and is designed for uhf use (also designated as RG-177/U).

Although I haven't mentioned the 75-ohm cables listed in Table 1, the same sort of arguments apply. RG-59/U is

a small diameter cable recommended for short cable runs between equipment in your station; RG-11/U is medium sized cable recommended for long runs to your antenna. Except for their impedance difference there is little practical difference between RG-8/U and RG-11/U, or between RG-58/U and RG-59/U for that matter.

Standing-wave ratio

As was mentioned earlier, the feedline losses given in Table 1 assume the input impedance to the antenna is the same as the characteristic impedance of the transmission line. However, if the antenna feedpoint impedance is not the same as that of the line, a mismatch results, and a portion of the rf energy is reflected back down the line toward the transmitter. This is most easily measured in terms of standing-wave ratio or swr. Although the complete story of reflected power and standing-wave ratios is beyond the scope of this article, just let me say that,

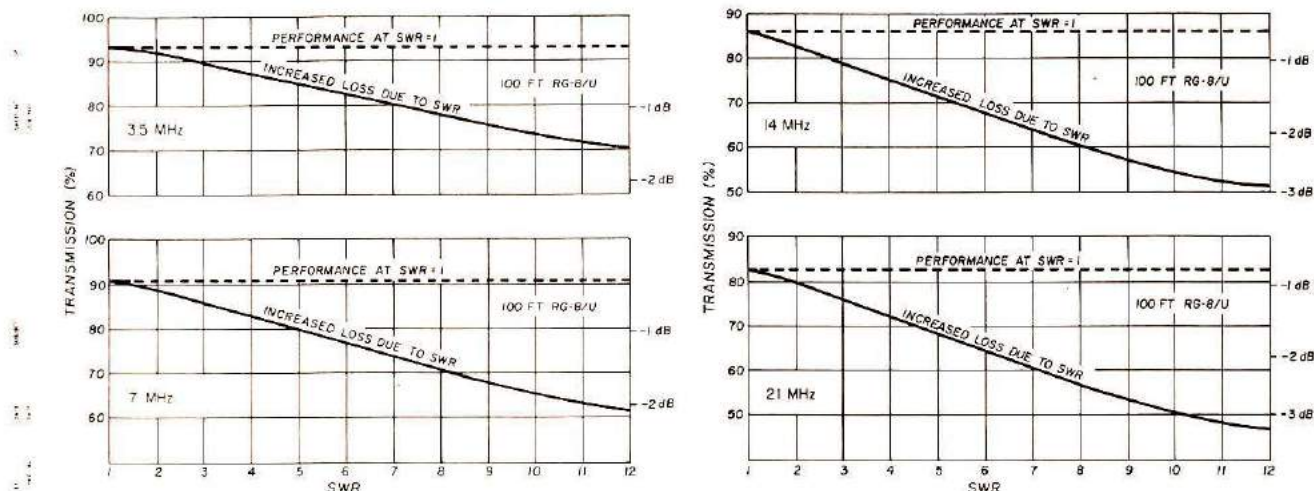


Fig. 9. The effect of swr on transmission line loss. So long as line loss with a matched load is low, as it is on the high-frequency amateur bands, swr has little effect.

contrary to popular belief, reflected power is *not* lost. However, a mismatched load does have the effect of increasing power loss because the portion of the rf power which is reflected makes two complete trips through the cable — once toward the antenna, the other back toward the transmitter. Since the reflected power makes two trips through the line, each with attenuation, it receives twice as much loss as that portion of the power which makes only one trip down the line to the antenna.

However, this slight additional loss is not serious on the high-frequency bands where cable attenuation is low, as shown in the four graphs in Fig. 9 for 100 feet (30m) of RG-8/U on 80, 40, 20 and 15 meters. Even at 21 MHz, where cable attenuation is relatively high at 0.81 dB per 100 feet, an swr of 5:1 — high compared to normal standards — increases total line loss by less than 1 dB; the difference would be barely perceptible in terms of received signal strength. On 3.5 MHz the effect of swr is perhaps even more surprising: An swr of 10:1 increases line loss by the same, barely perceptible 1 dB.

If cable attenuation is high, as would be the case at vhf or if you were using long runs of

higher loss cables such as RG-58/U, high swr can drastically increase power loss. This is another good reason to choose lower loss lines such as RG-8/U or RG-11/U. If high swr doesn't cause significant power loss on the high-frequency bands, why, you may ask, do so many operators worry about getting the swr down to 2:1 or less? Because the tank circuits in modern transmitters simply aren't designed to cope with an swr greater than that. They could be, but it would increase their selling price. Also, high swr seriously degrades the power handling ability of the line so if you run high power and have high swr you may find that you are operating above the power limits of the line. If this happens, the line may actually get hot enough to burst.

On the other hand, you're not going to gain much by twiddling with your high-frequency antenna to get a perfect match. So long as the swr is less than 2:1, your transmitter doesn't care, and the station at the other end won't be able to tell the difference.

If the swr on your transmission line is greater than 2:1, you probably won't be able to tune your transmitter to its maximum rated input. Swr

can be reduced only at the load end of the line, so you may be able to get a better match to the line by pruning your antenna — a better match means lower swr. On the other hand, you may be using an antenna with a feedpoint impedance that presents more than 2:1 mismatch to your transmission line — such as a very short vertical, or a dipole that is operated at a frequency well away from resonance. This often happens on 80 meters when you want to use a single antenna to work CW on the low end near 3.5 MHz, and 75-meter sideband near the upper band edge. If you cut the dipole for the center of the band, at 3750 kHz, you'll find that the swr at 3.5 and 4.0 MHz will be close to 5:1. The solution here is to use an antenna tuner or Transmatch between your transmitter and the feedline as shown in Fig. 10. When the Transmatch is tuned properly, it will present a 50-ohm load to your transmitter. So long as the swr on the line is within reasonable limits — say 10:1 with RG-8/U on 80 meters — the stations you are working won't know the difference.

Installing your transmission line

If you're using coaxial cable, it's pretty hard to get into trouble,

but here are some tips that will help get the most out of it.

1. Use coaxial connectors which are designed for the cable you are using, and make sure they are properly installed. Complete assembly directions are usually provided when you buy the connectors, but if they're not, any recent edition of the *ARRL Antenna Handbook* will show you how.

2. If you use a coaxial connector where it's exposed to the weather, weather-proof it with several coverings of plastic electrical tape. If moisture seeps into the cable through an unprotected connector, at the very least it will increase loss — at the very worst it will short-circuit the line.

3. If you suspect that moisture has gotten into the line, you can often tell by removing the connector. The copper braid should be bright and shiny, and the center insulator should look the same as it did when you originally put the connector on. If you're in doubt on this point, compare it with a piece of new cable. If



Some of the many types of coaxial cable which are available on the market. Several of the cables shown here have double braids for additional shielding.

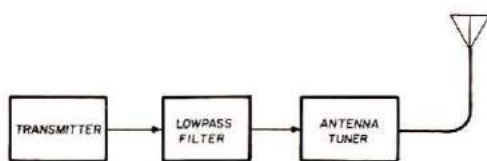


Fig. 10. Using an antenna tuner to provide a good match to your transmitter. Swr on the line between the tuner and the antenna is of little importance if line loss is low. The lowpass filter behaves as it should only when it's terminated in a matched load, so it should be placed between the transmitter and the antenna tuner.

you do find evidence of moisture you probably won't have to replace the entire length of cable — unless it has been exposed to moisture for a fairly long time. If you cut it back a foot (30cm) at a time, you'll probably find that several feet (1-2m) back from the damaged end the line is as good as new.

4. If you have to run your coaxial line under a window to get to your antenna, don't push the sash down so hard it mashes the cable. If the cable is pinched, it changes its characteristic impedance and increases the swr on the line, no matter how well your antenna is matched. If you want to run your cable under a window, make a wood spacer that runs the full width of the window and close the sash on it. Then drill a hole through the spacer slightly larger than the outside diameter of the cable (or large enough to pass the connector if it is already installed).

5. Don't install coaxial cable with tight bends; this changes the conductor spacing which affects the impedance of the line. If you have a very tight bend in the cable, the center conductor may eventually work its way through the insulator until it touches the outer braid, shorting out the line. What do I mean by a tight bend? A bend radius less than about ten times the diameter of the cable — about 4 inches (10cm) for medium-sized cable such as RG-8/U, or 2 inches (5cm) for

small cables like RG-58/U and RG-59/U.

6. Don't install coaxial cables near hot-air ducts, furnace pipes, or steam radiators. The thermoplastics used in cable manufacturing get soft with rising temperatures and may swell out through the braid. The center conductor can also sink, from the force of gravity, through the temperature-softened center insulator and short out the cable. When either of these things happen, the cable is permanently damaged and must be replaced.

7. Use cable hangers or supports for long cable runs. The "Pop-Top" lids from drink cans fit nicely over RG-8/U and make excellent cable hangers — just drive a small nail through the tab into the nearest support. If you run a coaxial cable to the top of your tower, tape it to one of the tower legs every four or five feet (1-2m).

8. Inspect the cable every six months or so to make sure it hasn't been knicked, cut, or otherwise damaged. If you discover the problem soon enough, you may be able to repair it before moisture destroys the usefulness of the complete cable. If you find a damaged spot in the center of a long run, cut the cable in two, remove the damaged portion, and install connectors on each end. Then buy a straight adapter (such as a PL-258) and connect the two cables together. If the junction is outside, seal it well with plastic electrical tape.

If you carefully choose your feedline, and follow these simple guidelines, your transmission line should last for a good many years. In fact, if you buy coaxial cable with a non-contaminating jacket you may never have to replace it; I know of one length of RG-8A/U in an underground run to a tower that doesn't have any more loss now than it did when it was buried fifteen years ago!

HRH